

200 ↗

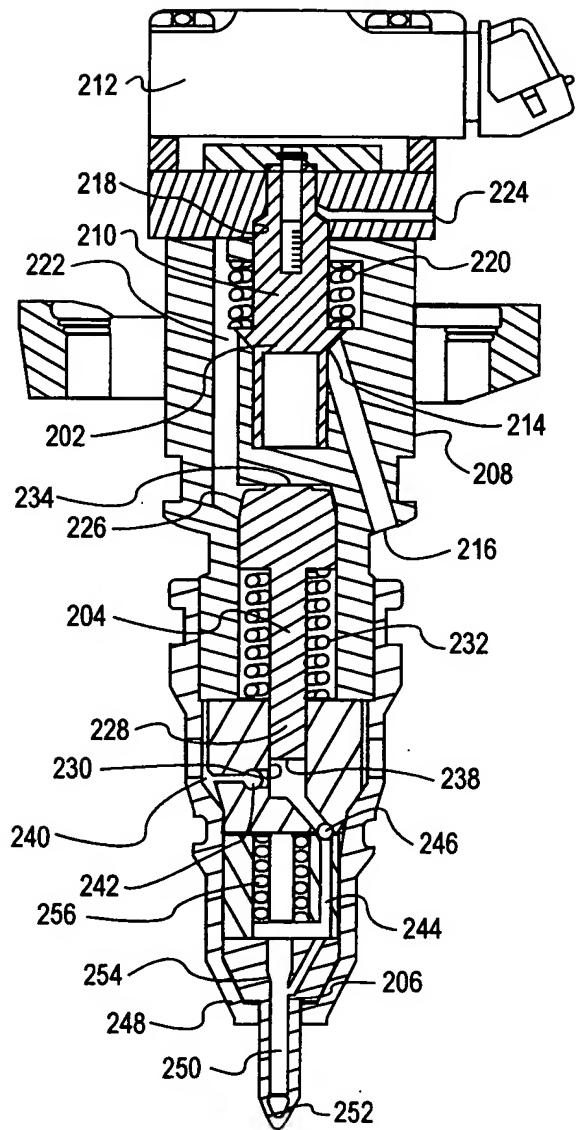


FIG. 1
PRIOR ART

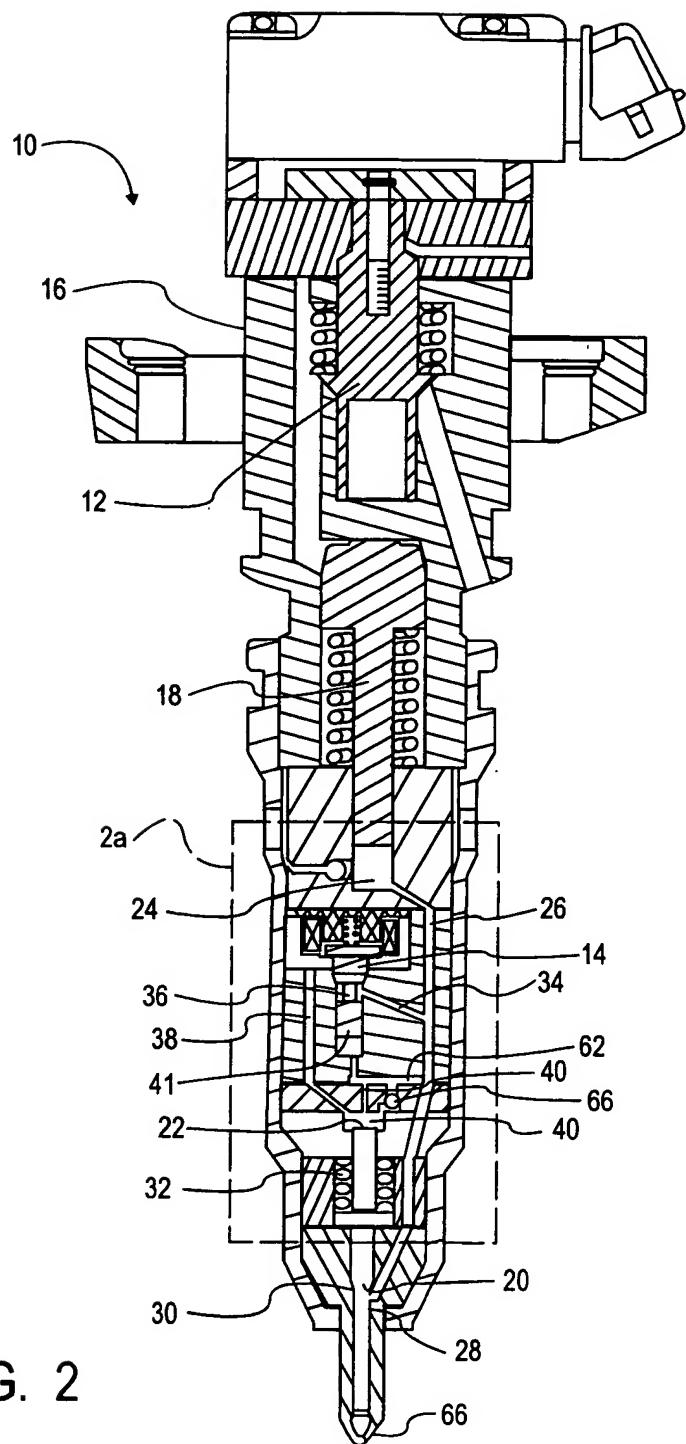


FIG. 2

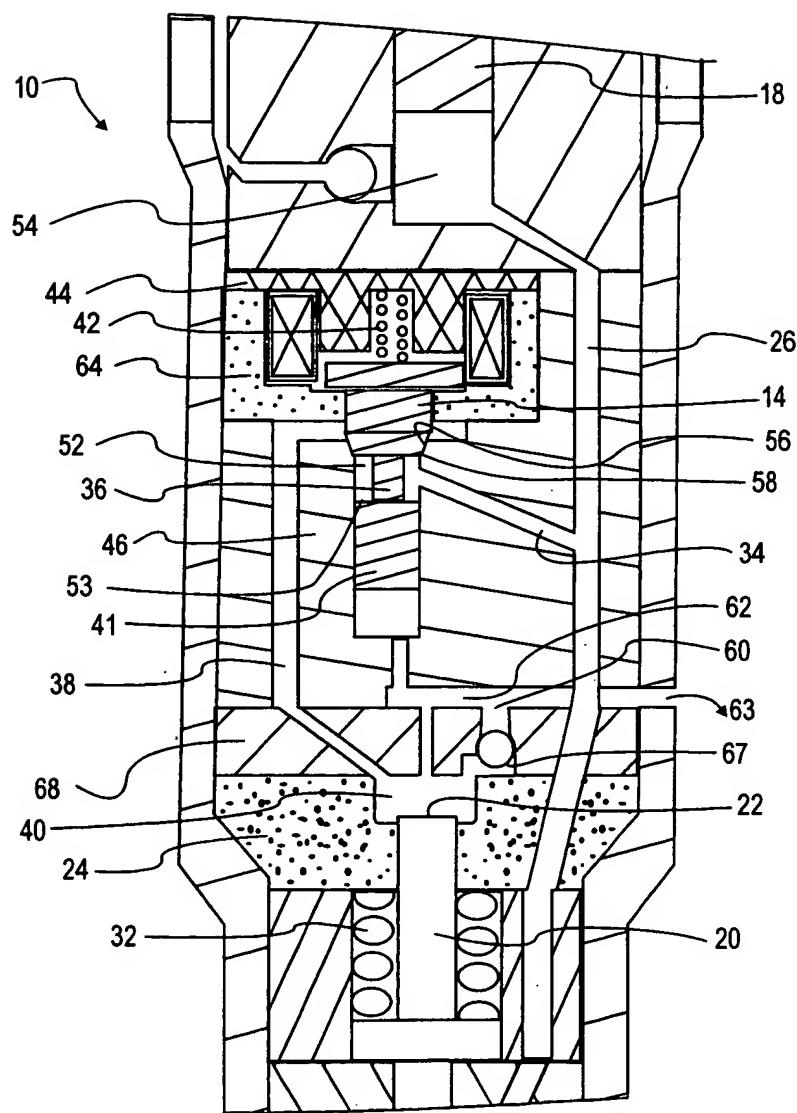


FIG. 2a

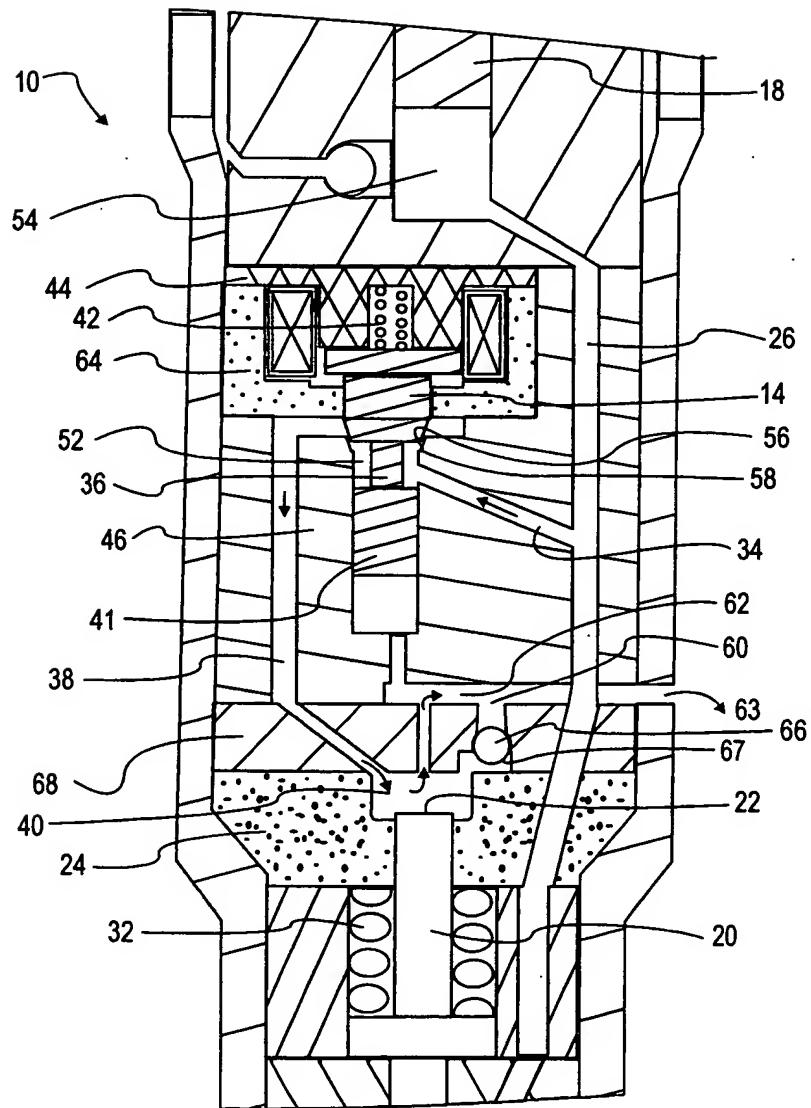


FIG. 2b

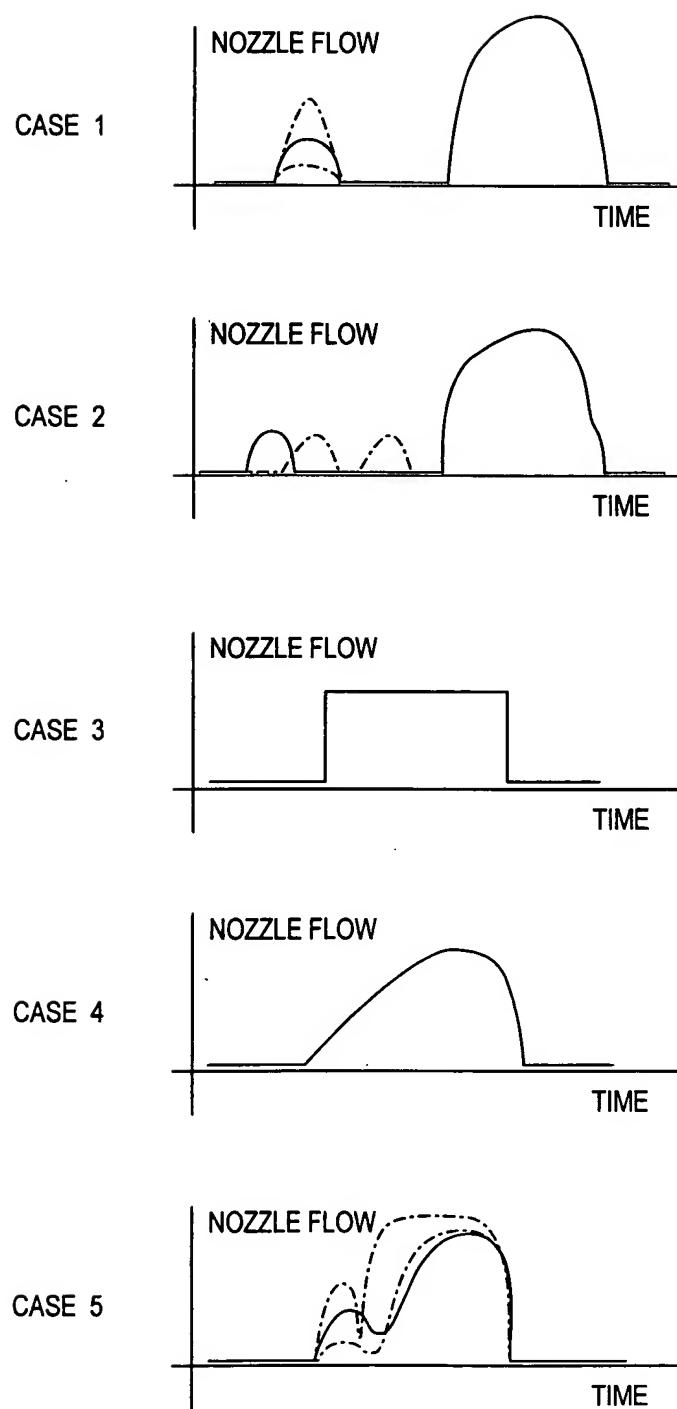
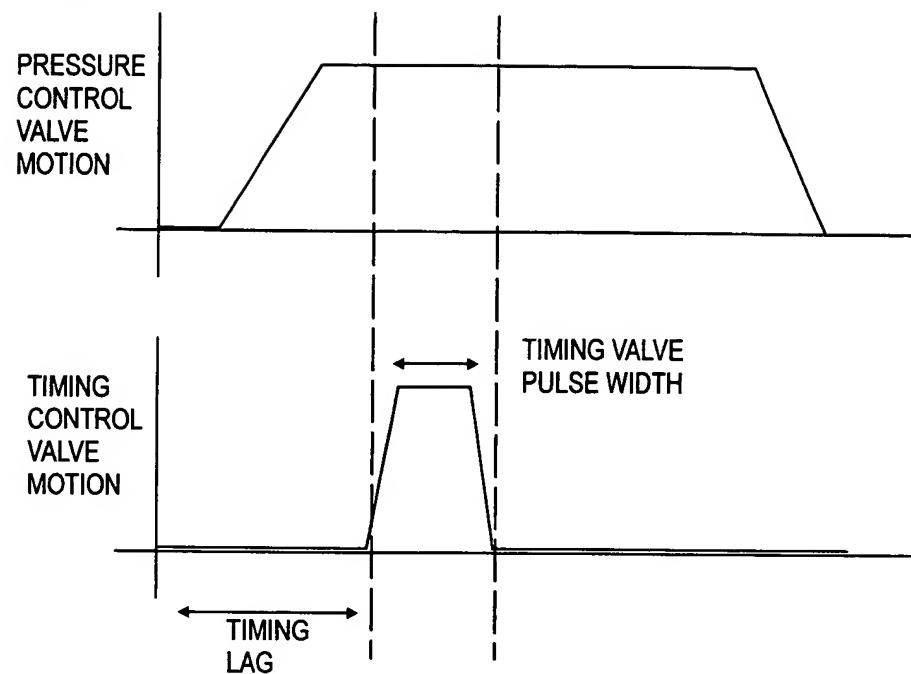
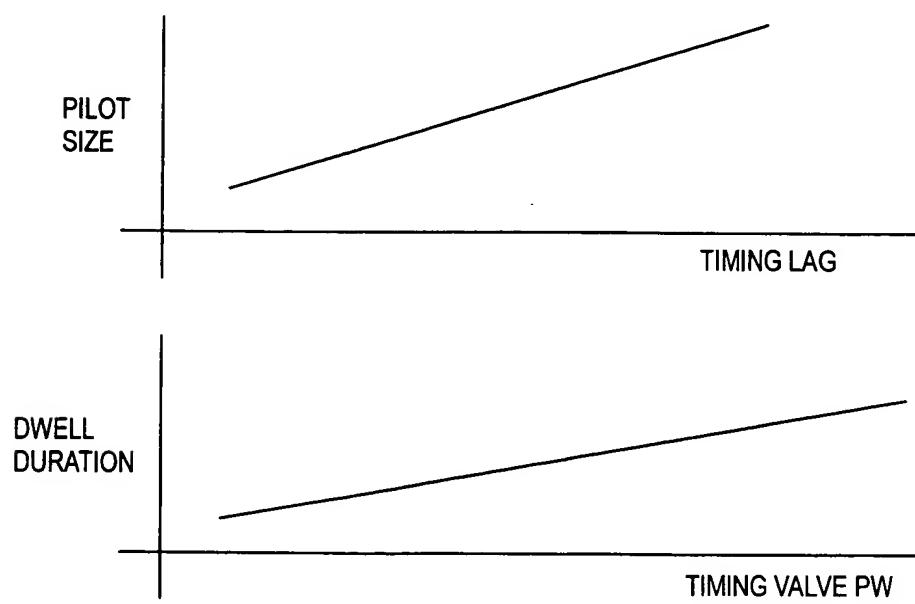
FIG. 3

FIG. 5**FIG. 6**

Piezo Controlled Direct Needle Actuation

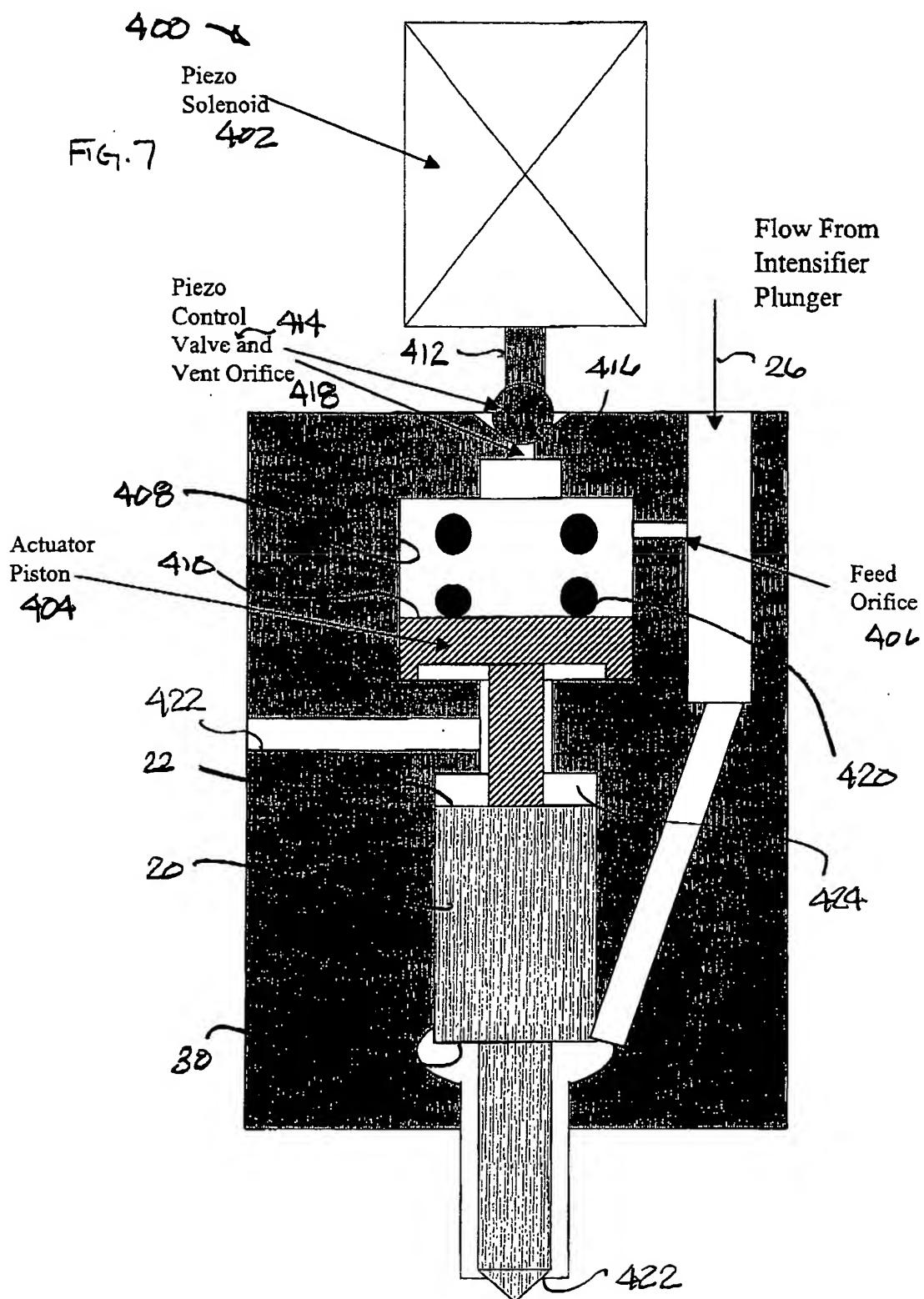
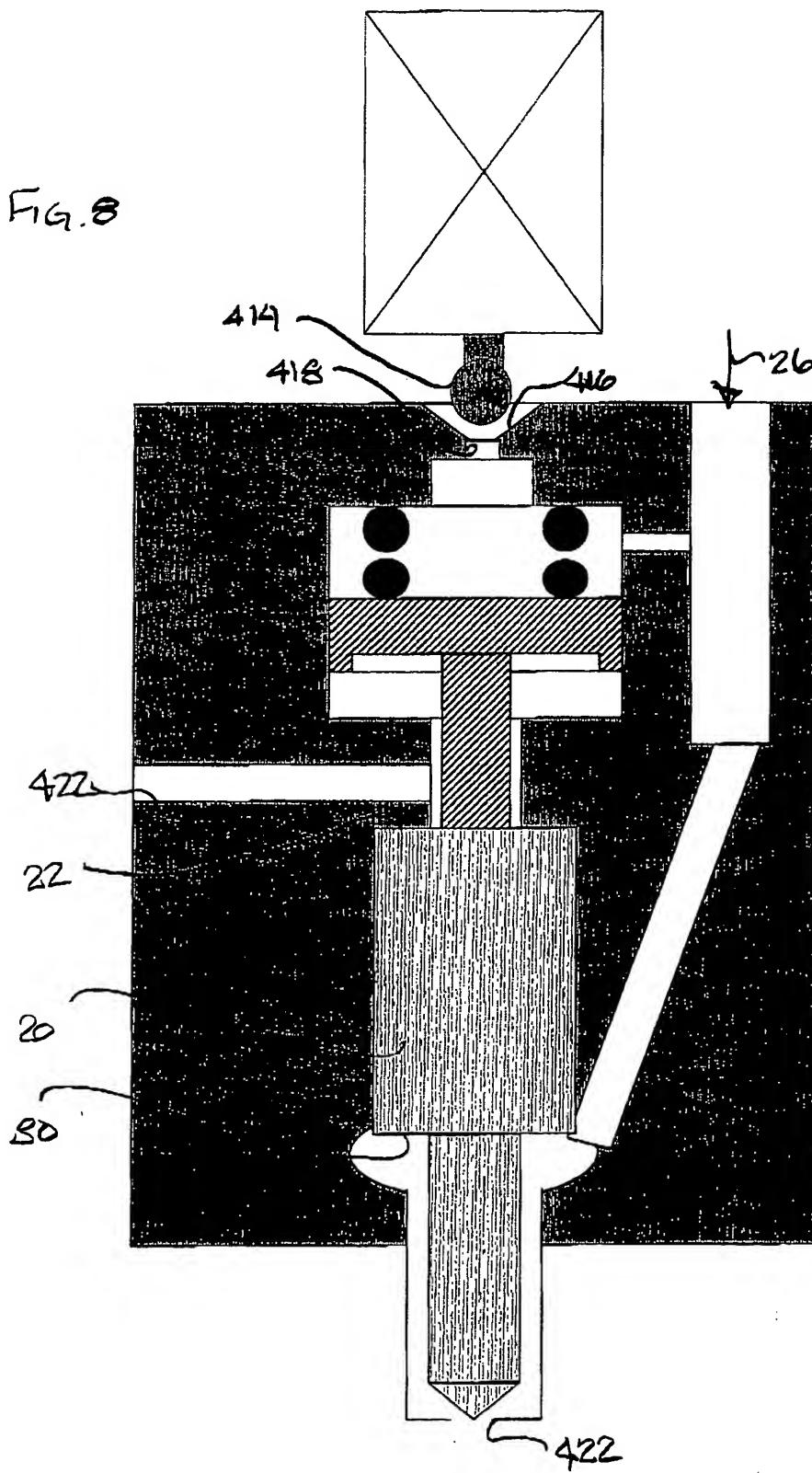


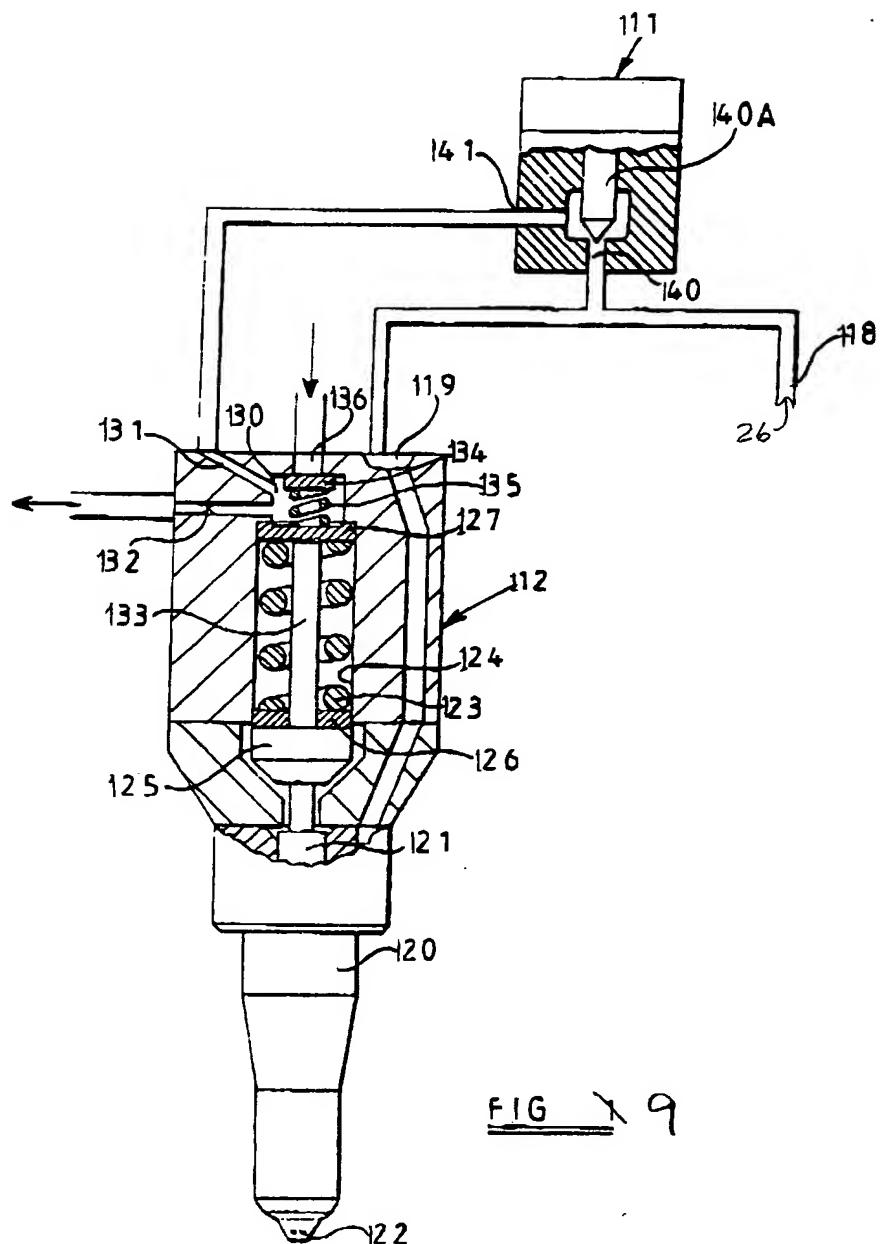
FIG. 8



U.S. Patent

Jun. 22, 1999

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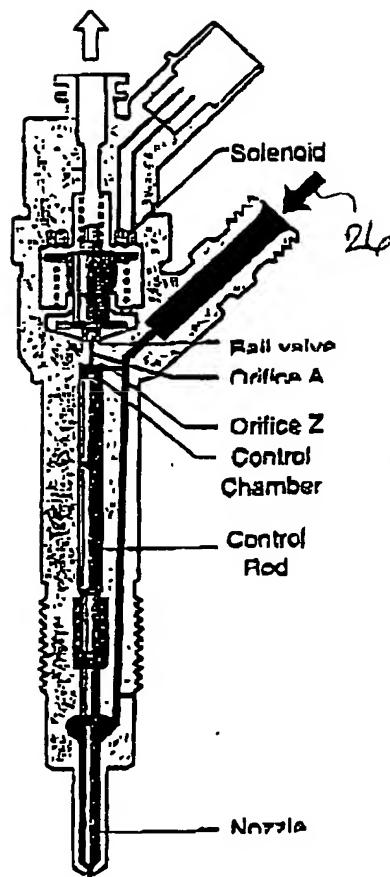


Fig. 10a

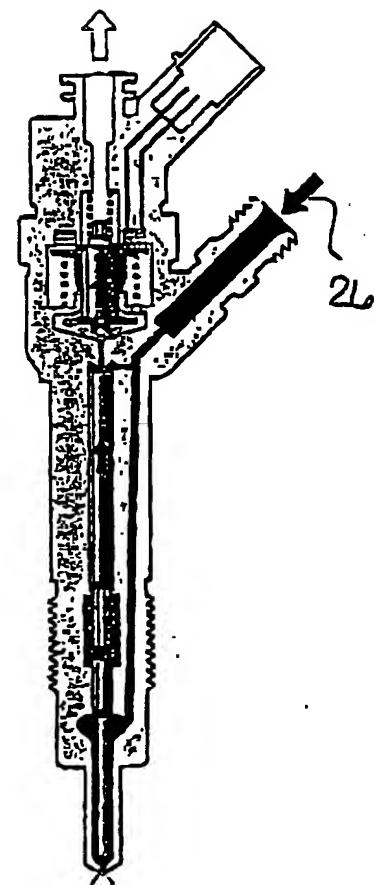


Fig. 10b